

NON-PUBLIC?: N
ACCESSION #: 8704130361
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Surry Power Station, Unit 2 PAGE: 1 of 5

DOCKET NUMBER: 05000281

TITLE: Rx Trip and Main Feedwater Pipe Failure
EVENT DATE: 12/09/86 LER #: 86-020-02 Revs 0 & 1 on file
REPORT DATE: 03/31/87

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: R. F. Saunders, Station Manager TELEPHONE #: 804-357-3184

SUPPLEMENTAL REPORTED EXPECTED: No

ABSTRACT: On December 9, 1986 at 1420, with Units 1 and 2 at 100% power, the Unit 2 reactor tripped due to low water level in "C" steam generator (EIIS-SG). The event was initiated by the closure of "C" main steam trip valve (MSTV) (EIIS-ISV). Approximately 40 seconds after the trip, a carbon steel elbow in the 18-inch suction pipe to the "A" main feed pump (EIIS-P) ruptured causing a loss of normal feedwater. Water flashing from the severed pipe engulfed equipment and personnel in the area. Several workers were seriously burned. Operators followed appropriate plant procedures and quickly stabilized the Unit following the trip.

Closure of the "C" MSTV was due to improper reassembly of the valve following maintenance. The ruptured feedwater piping has been attributed to pipe wall thinning due to an erosion/corrosion phenomenon. Unit 1 was shut down on December 10, 1986 as a precautionary measure. Both Units MSTVs were inspected and tested prior to startup. A systematic inspection of both units was conducted and piping exhibiting unacceptable thinning has been replaced.

(End of Abstract)

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1.0 Description of the Event

On December 9, 1986 at 1420, with Units 1 and 2 at 100% power, the Unit 2 reactor tripped due to low water level in the "C" steam generator (EHS-SG). The reactor trip was initiated by the closure of "C" main steam trip valve (EHS-ISV). Approximately 40 seconds after the trip, a carbon steel elbow in the 18 inch suction pipe to "A" main feed pump (MFP) (EHS-P) ruptured causing a loss of normal feedwater. Water flashing from the severed pipe engulfed equipment and personnel in the area. Several workers were seriously burned.

Following the trip, all control and protection systems functioned as expected with the exception of the following:

- 1) "C" main steam trip valve (MSTV) did not indicate full closed.
- 2) Rod M-10 (EHS-ROD) did not indicate fully inserted.

Other Important System Malfunctions Included:

- 1) Lengthy response time of the security key-card readers (EHS-IA).
- 2) Automatic discharge of Halon (EHS-KQ) and Cardox (Carbon Dioxide) (EHS-LW) fire suppression systems.

Operators followed appropriate plant procedures and quickly stabilized the Unit following the trip.

2.0 Safety Consequences and Implications

The purpose of the main steam line trip valve is to close immediately in the event of a rupture in the main steam line between the valve and the turbine, thus preventing rapid flashing and blowdown of the shell side of the steam generator.

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The loss of normal feedwater is an analyzed transient and does not result in any adverse condition in the core. The auxiliary feedwater system (2 motor driven and 1 steam turbine auxiliary feedwater pumps) functioned as designed to provide feedwater to the steam generators. In addition, all other associated safety related systems remained operable during the event and plant parameters remained within the bounds of the accident analysis. Therefore, this event did not constitute an unreviewed safety question and the health and safety of the public were not affected.

3.0 Cause

The reactor trip due to low water level in "C" steam generator was initiated from the closure of "C" MSTV. Closure of the "C" MSTV was due to improper reassembly following maintenance. The bonnet was replaced in a misoriented condition. This prevented the valve from opening fully and allowed the disc to be deflected and closed by main steam. The cause of the ruptured feedwater piping has been attributed to pipe wall thinning. Turbulent feedwater flow, piping geometry, coupled with the low oxygen content of feedwater has been determined to have resulted in an erosion/corrosion mechanism which thinned the elbow pipe wall.

Secondary Cause Failures

1. Failure of "C" MSTV to indicate full closed has been attributed to limit switch contacts not correctly adjusted.
2. The failure of Rod M-10 to immediately indicate a fully inserted position has been attributed to instrumentation drift.
3. Lengthy response time of the security key-card readers has been attributed to the adverse steam/water environment.
4. The inadvertent discharge of Halon and Cardox fire suppression systems has been attributed to water shorting the control systems.

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4.0 Immediate Corrective Actions

Operators performed all appropriate Emergency Procedures to ensure the plant was in a stable condition. Also, the Shift Technical Advisor performed the status tree reviews to ensure specific plant parameters were within safety bounds. The plant was cooled down using the "C" power operated relief valve and the Unit reached cold shutdown at 0710 hours on December 10, 1986.

Other Actions Included:

Stopping secondary pumps feeding the break and verifying main feedwater isolation.

Verifying main steam isolation using main steam flow indication.

Shifting reactor coolant makeup to the refueling water storage tank

to obtain cold shut down boration.

Bypassing failed computer controlled key-card readers and posting security officer

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Administering first aid to injured personnel and arranging off site transport.

5.0 Additional Corrective Actions

An unusual event was declared and later upgraded to an alert even though not required by the Emergency Action Level Table. The alert was declared to obtain personnel accountability.

Fire watches were established due to the loss of Cardox and isolation of Unit 2 Turbine Building Sprinkler System.

Fire watches were established in the Emergency Switchgear Room as a compensatory measure because of the loss of Halon.

Radiation monitoring was initiated on "C" steam generator to verify there was no primary to secondary leakage.

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6.0 Actions Taken to Prevent Recurrence

Unit 1 was shutdown on December 10, 1986 as a precautionary measure. Both Unit's MSTVs were inspected and tested prior to startup. A systematic inspection of both Units was conducted to identify other areas that may be affected by the erosion/corrosion phenomenon. Piping exhibiting unacceptable thinning has been replaced. ISI programs for secondary piping are under review for revision to incorporate the results of the piping inspections. Additional corrective actions have been undertaken as described in revision 1 of the attached supplemental report.

7.0 Similar Events

None.

8.0 Manufacturer/Model Number

MFP suction piping: 18 inch diameter, Class 301 Carbon Steel seamless, A106, Grade B, extra strong.

ATTACHMENT # 1 TO ANO # 8704130361 PAGE: 1 of 1

Vepco VIRGINIA ELECTRIC AND POWER COMPANY
Surry Power Station
P.O. Box 315
Surry, VA 23883

March 31, 1987

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Washington, D.C. 20555

Gentlemen:

Pursuant to Surry Power Station Technical Specifications, Virginia Electric and Power Company hereby submits the following updated Licensee Event Report for Surry Unit 2.

REPORT NUMBER

86-020-02

This report has been reviewed by the Station Nuclear Safety and Operating Committee and will be reviewed by Safety Evaluation and Control.

Very truly yours,

/s/ R. F. Saunders
R. F. Saunders
Station Manager

Enclosure

cc: Dr. J. Nelson Grace
Regional Administrator
Suite 2900
101 Marietta Street, NW
Atlanta, Georgia 30323

ANO # 8704130351

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